PROXIMATE ANALYSIS OF SOME RAY SPECIES CAUGHT BY TRAWLING IN MEDITERRENEAN GULF OF ANTALYA (TURKEY)

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HEMIJSKI SASTAV NEKIH VRSTA RAŽA ULOVLJENIH KOČARENJEM U MEDITERANSKOM ZALIVU ANTALIJA (TURSKA)

Abstract
The objective of this study is to determine the proximate analysis of some ray species caught by trawling in the Gulf of Antalya. Proximate analyses revealed non significant ($P>0.05$), differences in moisture among brown ray, thornback ray, common stingray and spiny butterfly ray. Of all the species analyses spiny butterfly ray had the highest protein content (22.46±2.18%). Common stingray and spiny butterfly ray had significantly different ($P<0.05$) levels of lipids compared to the others. Common stingray also had the highest ash content (2.96±0.02%) compared to the others. Therefore, it was concluded that discard fish species such as brown ray, thornback ray, common stingray and spiny butterfly ray would be use as a source of protein for human diet.

Key words: *Rajidae, proximate analysis, trawl, Gulf of Antalya, protein*

INTRODUCTION

Fishery products, like many other animal products, contain water, proteins and other nitrogenous compounds, lipids, carbohydrates, minerals and vitamins. Proteins and lipids are the major components of fish (Murray and Burt, 2001). The chemical composition of fish varies greatly from one species and one individual to another depending on sex, age, environment and season. Therefore, a substantial normal variation is observed for the constituents of fish muscle. The knowledge of proximate composition of fishery species has fundamental importance in the application of different technological processes (Connell, 1975). Proximate composition is also important as an aspect of quality of raw material, sensory attributes and storage stability (Sikorski, 1994).

All rays has a flattened body with broad, wing like pectoral fins. The body is kite-shaped with a long, thorny tail. The back is covered in numerous thorny spines. The rays are usually found on sediment type seabeds such as mud, sand or gravel at depths between 10-60 m (Anonymous, 2011).

In this study, rays; Brown ray (*Raja miraletus*), Thornback ray (*Raja clavata*), Common stingray (*Dasyatis pastinaca*) and Spiny butterfly ray (*Gymnura altavela*) are locally commercially important in the Mediterranean; bycatch of the demersal fishery (FAO, 2005). There is a little information on proximate composition of these rays from Turkey. Therefore, the aim of this study was to investigate proximate composition of the four rays caught in the Gulf of Antalya.

MATERIALS AND METHODS

In the Gulf of Antalya several trawls from different depths were performed using the research vessel of Akdeniz University, and this resulted in the selection of four ray species: Brown ray (*Raja miraletus*), Thornback ray (*Raja clavata*), Common stingray (*Dasyatis pastinaca*) and Spiny butterfly ray (*Gymnura altavela*) have been obtained. In the Gulf of Antalya two different trawl regions were selected. In this regions shallow trawls (25-50 m) and mid depht trawls (150-200 m) were performed. 11 trawls occurred during the day and 10 during the night, resulting in a total of 21 trawls (Table 1). The fish were then transported to our laboratory in polystyrene boxes in crushed ice. The viscera of the fish were removed and the leftovers such as blood, mucus and tissue pieces were washed with large amount of water.

The chemical contents of four discard fish species were determined according to the Official Methods of Analysis. Moisture content was determined according to the Official Method 950.46 (2002a). Crude protein content (Nx6.25) was calculated using the Kjeldahl method 928.08 (2002b). Lipid (fat) content was determined according to the Soxhlet method 960.39 (2002c). Crude ash (inorganic matter) was determined according to method 920.153 (2002d).

Every parameter was measured in triplicate for each sample. Statistical analyses were performed using SPSS 9.0 for Window software (SPSS INC. Chicago, IL, USA). Analysis of variance (ANOVA) were used for statistical significance was at $P<0.05$.

Table 1. The catching some ray species and their amounts from shallow (25-50 m) and mid depth (150-200 m) water trawling.

Some Ray Species	Shallow trawls (Kg)	Mid depth trawls (Kg)	Total caught amount (Kg)
Brown ray (*Raja miraletus*)	4.20	19.60	23.80
Thornback ray (*Raja clavata)*	0.43	76.22	76.65
Common stingray (*Dasyatis pastinaca)*	-	11.60	11.60
Spiny butterfly ray (*Gymnura altavela)*	-	36.30	36.30

RESULTS AND DISCUSSION

Table 2 shows the result of biometric measurements of the four fish species. The weight of spiny butterfly ray is higher than other three rays.

Proximate composition of four rays was presented in Table 2. The average moisture content was determined as 76.76±0.07% for brown ray; 77.33±0.01% for thornback ray; 76.59±1.87% for common stingray and 75.38±0.07% for spiny butterfly ray. The water proportion was higher in thornback ray than other species and this differences were found statistically insignificant (P>0.05) (Table 1). There were no statistically significant differences (P>0.05) in moisture content among all species. The chemical composition of fish muscle varies greatly from one species and one individual to another depending on age, sex, environment and season (Turan et al. 2006). Actually, the variation in the chemical composition of fish is closely related to feed intake, migratory swimming and sexual changes in connection with spawning (Bandarra et al. 2001; Tzikas et al. 2007). For this reason it was difficult to compare our findings with those of other researchers.

The lipid content was found the most highest in spiny butterfly ray, whereas the lowest was in the brown ray (See Table 2). All of the rays can be classified as a lean fish with its low fat content.

The crude ash content of brown ray, thornback ray, common stingray, and spiny butterfly ray were determined as 1.30%, 1.36%, 2.96%, and 1.33%, respectively. The ash content of common stingray was determined to be the best high among all species.

The protein content of spiny butterfly ray is higher than three rays, whereas the lowest was in brown ray. This difference was statistically significant ($P<0.05$). In addition, protein proportion in the thornback ray was determined as 18.76±0.10%. In a study concerning thornback ray, protein proportion was found as 20.02±0.00% (Turan et al. 2007). This value was higher than our. It was thought that these differences were from different environment or age. Yılmaz and Akpınar (2003) determined the protein content of thornback ray (*Raja clavata*) as 19.46%. In this research, it was determined that the thornback ray has high protein content as well as other species.

Table 2. Biometric measurement of some ray species.

Species	Total Weight (g)	Total Lenght (cm)
Brown ray	321.07±50.92	37.37±1.11
Thornback ray	335.65±21.60	36.60±11.05
Common stingray	475.50±40.08	39.20±0.89
Spiny butterfly ray	748.60±32.00	30.20±0.74

Table 3. Chemical composition of some ray species.

Species	Moisture	Protein	Lipid	Ash
Brown ray	76.76±0.07^{a}	17.77±1.26^{b}	0.25±0.02^{c}	1.30±0.02^{b}
Thornback ray	77.33±0.01^{a}	18.76±0.10^{b}	0.47±0.01^{b}	1.36±0.11^{b}
Common stingray	76.59±1.87^{a}	19.35±0.56^{b}	0.75±0.00^{a}	2.96±0.02^{a}
Spiny butterfly ray	75.38±0.07^{a}	22.46±2.18^{a}	0.77±0.01^{a}	1.33±0.09^{b}

Values are shown as mean ± standard deviation of triplicate measurements. Different superscript letters in the same row indicate significant differences among groups ($P<0.05$).

CONCLUSIONS

In the study, whereas some differences were found among species, chemical compositions of ray species were very similar. Lipid contents of all the species were found as poor. However, protein content were found to be high in all the species. A great portion of these rays caught in Turkey is discarded. By-catches can be evaluated as a valuable source for fish processors. Besides, all of the rays can be used as a good protein source for human diet.

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